

Willamette Valley Project Interim Measures Implementation Plan

Revised June 2020

Willamette Valley Project Interim Measures

Measure No.	Category	Species	Interim Measure	Page No.
Willamette -- General				
1	Habitat	Both	Within the existing project identification and selection process, the Bonneville Power Administration (Bonneville) and the Corps will work with the WATER Habitat Technical Team to: (1) create a solicitation with the goal of identifying a third-party sponsor to propose one or more projects for large wood placement below dams during the Willamette River Anchor Habitat Investments process; and (2) prioritize the implementation of the project(s) among other proposals.	2
2	Habitat	Both	Through the Willamette River Anchor Habitat Investments process, Bonneville and the Corps will work with the WATER Habitat Technical Team to: (1) create a solicitation with the goal of identifying a third party sponsor to propose one or more projects for placing sediment below the dams; and (2) prioritize the implementation of the project(s) among other proposals.	3
3	Hatchery	Chinook	By July 2021, the Corps will use existing information to conduct a comprehensive assessment of the potential benefits of reducing or ending stocking non-native hatchery trout associated with the agency's Willamette Trout Hatchery Mitigation Program into Willamette reservoirs. The assessment will also consider whether additional Research, Monitoring, and Evaluation (RM&E) actions are required to further assess effects of stocked hatchery rainbow trout on the reintroduction and recovery of ESA-listed salmon above and below dams. The assessment would prioritize consideration of areas where efforts are underway to reintroduce ESA-listed fish.	4
N. Santiam (Minto, Big Cliff, Detroit)				
4	Upstream Passage	Chinook	The Corps and National Marine Fisheries Service (NMFS), in conjunction with the rest of the WATER technical teams, will assess the genetic pedigree of adult spring Chinook returns to Minto Trap using data collected through 2019. The assessment will evaluate the performance of adult spring Chinook salmon trapped and transported above Minto Fish Facility and Detroit Dam and identify refinements to trap-and haul approaches for wild adult Chinook returns to the Minto Trap.	5
5	Downstream Passage	Chinook	Beginning in fall 2020, the Corps will modify Detroit Dam operations during the drawdown when fish passage rates are high, as follows: Once the reservoir elevation is less than 100 feet over the turbine intakes (elevation 1500 feet to 1450 feet), typically around November 1 through February 1, turbines will not be operated at Detroit Dam between 6:00 AM - 10:00 AM and 6:00 PM - 10:00 PM except for station service power. The Corps will manage discharge from Detroit Dam to reduce total dissolved gas (TDG) levels downstream of Big Cliff dam.	6
6	Total Dissolved Gas	Both	Beginning in 2020, the Corps will operate multiple spillway gates at Big Cliff Dam to spread total flow across the spillway and reduce TDG levels below Big Cliff Dam. The operation occurs when the Corps is operating the spillway (e.g., high flow events). The Corps will monitor TDG downstream and identify the extent that TDG criteria is met under this operation.	7
7	Spill	Chinook	Beginning June 1, 2021, when the Detroit Dam reservoir is above the spillway crest, the Corps will use a blend of spillway and turbine releases for summer water temperature management until the reservoir is drawn down below spillway crest. Once the reservoir is below the spillway crest, the Corps will shift to turbine only releases until mid- to late October or until outflow water temperatures reach 50 degrees Fahrenheit. The Corps will utilize the upper RO in conjunction with turbine releases into November.	8
S. Santiam (Green Peter, Foster)				
8	Downstream Passage	Chinook	In 2020, the Corps, in conjunction with the WATER technical teams, will develop an initial RM&E plan using existing information to assess the potential for upstream and downstream fish passage in the Middle Santiam River. The RM&E plan would be used to inform future decisions regarding RM&E and fish passage, including the possibility of rebuilding the juvenile fish bypass system at Green Peter Dam.	9

Measure No.	Category	Species	Interim Measure	Page No.
9	Downstream Passage	Chinook	Beginning in fall 2020, the Corps will conduct an operation at Foster Dam during fall and spring months. The Corps will operate the spillway from 7:00 PM to 7:00 AM from October 1 - December 15 and March 1 - June 15. From 7:00 PM to 7:00 AM during that timeframe, the turbines will be operated at limited capacity for station service power only. The Corps will coordinate this operation with Measure 10 to ensure that the needs of adult and juvenile salmonids are balanced.	10
10	Spill & Total Dissolved Gas	Chinook	Beginning approximately July 2020 for one to two months, the Corps will operate Foster Dam using both turbines and spill over fish weirs to optimize temperature for adult salmonid collection and to reduce TDG downstream. The Corps will coordinate with NMFS and WATER groups to evaluate the operation's consequences on water availability and downstream flow objectives (as appropriate, the Corps may modify this operation based on the recommendations from WATER groups and NMFS). The Corps will coordinate this operation with Measure 9 to ensure that the needs of adult and juvenile salmonids are balanced.	11
11	Habitat	Steelhead	In 2020, the Corps will provide a comprehensive review of options for new outplanting sites or improving existing outplanting sites in the South Santiam River above Foster Reservoir.	12
12	Flow	Chinook	The Corps will coordinate with Bonneville to provide additional opportunities for flow augmentation releases in the fall months at Green Peter Dam when the conservation pool is depleted, by structuring power generation from the power pool in ways that increase water releases from the project.	13
13	Hatchery	Chinook	By July 2021, the Corps will use existing information to conduct a comprehensive assessment of the potential benefits of reducing spring Chinook salmon hatchery releases in the South Santiam River associated with the agency's Willamette Spring Chinook Hatchery Mitigation Program. The assessment will also consider whether additional RM&E is required to further assess effects of hatchery-origin production on the reintroduction and recovery of ESA-listed salmon above and below dams.	14
McKenzie (Cougar, Blue River)				
14	Upstream Passage	Chinook	The Corps and NMFS, in conjunction with the rest of the WATER technical teams, will assess the genetic pedigree of adult spring Chinook returns to Cougar Trap using data collected through 2019. The assessment will evaluate the performance of adult spring Chinook salmon trapped and transported above Cougar Dam and identify refinements to trap and haul approaches for wild (unmarked) adult Chinook returns to Cougar Trap.	15
15	Downstream Passage	Chinook	In 2020, the Corps will employ a split gate operation at the temperature tower at Cougar Dam to minimize fish passage rates through the regulating outlet or penstocks when the pool is greater than 1570 feet and optimize fish passage efficiency when the pool is between 1570 feet and 1516 feet.	16
16	Downstream Passage	Chinook	In 2021, the Corps will limit refill of Cougar Reservoir to 1600 feet beginning February 1 and operate to achieve a reservoir elevation of 1570 feet on or before September 1. Once the reservoir is below 1570 feet to January 1, regulating outlet and turbine operations would follow Special Operations Request (SOR) 2019 and 2020 Table 1, recognizing Table 1 is a concept only and actual operations will be developed by the Corps and managed on a real-time basis. The operation is subject to a determination on whether to implement Measure 16 or Measure 17 (as the operations are not compatible).	17
17	Downstream Passage	Chinook	The Corps will model the following operation to determine, in coordination with NMFS, whether the operation should replace Measure 16 for implementation (as the operations are not compatible). The proposed operation would delay refill of Cougar Reservoir to maintain a lower pool from February 1 to May 1 (depending on hydrology), where the lower pool levels would be determined in coordination with NMFS and informed by hydrologic modeling that balances fish passage performance, supplementing downstream flows, and water temperature operations. April 1 to June 15 regulating outlet and turbine operations would follow SOR 2019 and 2020 Table 1, recognizing Table 1 is a concept only and actual operations will be developed by the Corps and managed on a real-time basis.	19
Middle Fork (Fall Creek, Dexter, Lookout Point)				

Measure No.	Category	Species	Interim Measure	Page No.
18	Upstream Passage	Chinook	In 2020, the Corps will operate Dexter Trap, or fund the Oregon Department of Fish and Wildlife (ODFW) to operate Dexter Trap, to prioritize best management practices for spring Chinook salmon being outplanted above Hills Creek and Lookout Point Dams. This includes assisting with the collection of salmon to reduce delay in migration timing, ensuring that fish in good condition are collected for outplanting, and collecting and transporting adults over multiple days during the migration season to avoid delaying adults below or within Dexter Trap.	21
19	Hatchery	Chinook	By July 2021, the Corps will use existing information to conduct a comprehensive assessment of the potential benefits of reducing spring Chinook salmon hatchery releases in the Middle Fork Willamette River associated with the agency's Willamette Spring Chinook Hatchery Mitigation Program. The assessment will also consider whether additional RM&E actions are required to further assess effects of hatchery-origin production on the reintroduction and recovery of ESA-listed salmon above and below dams.	22
20	Downstream Passage	Chinook	Beginning in fall 2020, the Corps will implement regulating outlet spill operations daily from 6:00 PM to 10:00 PM at Hills Creek Dam when the reservoir elevation is less than or equal to 50 feet over the turbine intakes (expected to occur by December 1) through March 1.	23
21	Downstream Passage	Chinook	Beginning in 2020, the Corps will refill Lookout Point Reservoir to 900 feet (if inflows allow) following the normal reservoir refill schedule in the water control diagram and then operate spillway gates to provide surface spill in the spring and summer as long as hydrologic conditions can support the operation, with a total discharge to meet downstream flow targets. During this same period, the Corps will conduct spill operations at Dexter Dam daily from 6:00 PM to 10:00 PM and limit turbine operations unless total discharge results in high TDG and there is a need to reduce spillway flows.	24
22	Downstream Passage	Chinook	Beginning in winter 2021, the Corps will operate trap(s) upstream of Fall Creek Reservoir to collect and transport juvenile spring Chinook salmon around the Reservoir and Fall Creek Dam during their migration season (approximately January to May), and the Corps will also consider installing fish guidance measures, such as resistance board weirs, to improve collection rates.	25
23	Downstream Passage	Chinook	As early as 2021, the Corps will provide surface spill from Fall Creek Reservoir from May 1 (or as soon thereafter as the reservoir elevation is above the spillway crest) through July 1, as hydrology allows.	26

These interim measures are intended to be implemented during the reinitiated consultation addressing the U.S. Army Corps of Engineers' (Corps) operation and maintenance of the Willamette Valley Project (WVP). The interim measures should not be construed as constituting the proposed action analyzed in the reinitiated consultation or elements of any alternative analyzed in the ongoing National Environmental Policy Act (NEPA) environmental reviews. Implementation of all interim measures is subject to the Corps' compliance with all applicable laws, including NEPA and the Endangered Species Act (ESA).

Implementation of all of the interim measures addressing operations (measures 5-7, 9-10, 12, 15-17, 20-22, 23) are subject to hydrologic conditions, adherence to minimum gate openings, and modifications as the Corps determines is necessary to (1) perform flood-risk management operations, (2) address state total dissolved gas (TDG) standards, (3) manage downstream temperature conditions in accordance with the National Marine Fisheries Service's (NMFS) 2008 Biological Opinion (BiOp) on WVP operations, as updated through the WATER process¹ and documented in the Willamette Fish Operations Plan (WFOP), and (4) address unforeseen conditions that impact the survival of Upper Willamette River (UWR) Chinook salmon and UWR winter steelhead (as applicable).

¹ The 2008 Biological Opinions created the Willamette Action Team for Ecosystem Restoration (WATER) as a coordination body (RPA1.1-1.4, 2.1). The WATER group consists of technical experts from applicable state agencies and the Tribes, along with the federal Action Agencies.

Interim measures relating to the Willamette River Basin**Measure Number: 1**

Description: Within the existing project identification and selection process, the Bonneville Power Administration (Bonneville) and the Corps will work with the WATER Habitat Technical Team to: (1) create a solicitation with the goal of identifying a third-party sponsor to propose one or more projects for large wood placement below dams during the Willamette River Anchor Habitat Investments process; and (2) prioritize the implementation of the project(s) among other proposals.

Additional Information: N/A

Feasibility: Generally feasible based on funding and finding available partners. Through the Willamette River Anchor Habitat Investments process, Bonneville, the Meyer Memorial Trust, and Oregon Watershed Enhancement Board (OWEB), fund projects in the Willamette River Basin that increase channel complexity and length, improve connectivity between the river and its flood-plain, and/or expand the geographic extent and improved health of flood-plain forests. OWEB administers an open solicitation for project proposals, and third-party sponsors such as land trusts, watershed councils, or other non-profits usually apply. The Willamette Technical Review Team reviews and ranks proposals based on established criteria. Sometimes funding is pooled for more efficient and effective restoration projects.

Limitations: Few. The contracting process allows for third-party sponsors.

Environmental & Cultural Compliance: The Corps assumes Bonneville would be lead agency for NEPA and National Historic Preservation Act (NHPA) compliance for this measure. Alternatively, the Corps could incorporate the analysis in the Corps' interim measures environmental assessment (EA) if Bonneville is a cooperating agency. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. Clean Water Act (CWA) compliance could be covered under Nationwide Permit 27, and ESA compliance is within scope of the 2008 NMFS BiOp.

Implementation Schedule: If a third party sponsor's proposal is selected, the project(s) would be proposed for funding in spring 2021² and implemented in 2022 to 2023, subject to the technical and review processes associated with the Willamette River Anchor Habitat Investments process and environmental reviews under NEPA, as necessary, and any other applicable laws.

Annual Research, Monitoring, and Evaluation (RM&E): N/A

² The 2020 project solicitation period has already closed.

Measure Number: 2

Description: Through the Willamette River Anchor Habitat Investments process, Bonneville and the Corps will work with the WATER Habitat Technical Team to: (1) create a solicitation with the goal of identifying a third party sponsor to propose one or more projects for placing sediment below the dams; and (2) prioritize the implementation of the project(s) among other proposals.

Additional Information: N/A

Feasibility: Generally feasible based on funding and finding available partners. Through the Willamette River Anchor Habitat Investments process, Bonneville, the Meyer Memorial Trust, and OWEB, fund projects in the Willamette River Basin that increase channel complexity and length, improve connectivity between the river and its flood-plain, and/or expand the geographic extent and improved health of flood-plain forests. OWEB administers an open solicitation for project proposals, and third-party sponsors such as land trusts, watershed councils, or other non-profits usually apply. The Willamette Technical Review Team reviews and ranks proposals based on established criteria. Sometimes funding is pooled for more efficient and effective restoration projects.

Limitations: Few. The contracting process allows for third-party sponsors.

Environmental & Cultural Compliance: The Corps assumes BPA would be lead agency for NEPA and NHPA compliance for this measure. Alternatively, the Corps could incorporate the analysis in the Corps' interim measures EA if BPA is a cooperating agency. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. CWA compliance could be covered under Nationwide Permit 27, and ESA compliance is within scope of the 2008 NMFS BiOp.

Implementation Schedule: If a third party sponsor's proposal is selected, the project(s) would be proposed for funding in spring 2021³ and implemented in 2022 to 2023, subject to the technical and review processes associated with the Willamette River Anchor Habitat Investments process and environmental reviews under NEPA, as necessary, and any other applicable laws.

Annual RM&E: N/A

³ The 2020 project solicitation period has already closed.

Measure Number: 3

Description: By July 2021, the Corps will use existing information to conduct a comprehensive assessment of the potential benefits of reducing or ending stocking non-native hatchery trout associated with the agency's Willamette Trout Hatchery Mitigation Program into Willamette reservoirs. The assessment will also consider whether additional RM&E actions are required to further assess effects of stocked hatchery rainbow trout on the reintroduction and recovery of ESA-listed salmon above and below dams. The assessment would prioritize consideration of areas where efforts are underway to reintroduce ESA-listed fish.

Additional Information: N/A

Feasibility: A review and assessment is feasible and current datasets exist that could inform the assessment.

Limitations: Additional RM&E may be required to fully assess effects of stocked hatchery rainbow trout on the reintroduction and recovery of ESA-listed salmon and steelhead above and below dams.

Environmental & Cultural Compliance: No environmental or cultural review is needed to complete the assessment.

Implementation Schedule: An initial assessment will be completed by July 2021.

Annual RM&E: As identified through the assessment.

Interim measures relating to the North Santiam River

Measure Number: 4

Description: The Corps and NMFS, in conjunction with the rest of the WATER technical teams, will assess the genetic pedigree of adult spring Chinook returns to Minto Trap using data collected through 2019. The assessment will evaluate the performance of adult spring Chinook salmon trapped and transported above Minto Fish Facility and Detroit Dam and identify refinements to trap-and haul approaches for wild adult Chinook returns to the Minto Trap.

Additional Information: N/A

Feasibility: The assessment is feasible. Methods for genetic pedigree of salmon populations are well established in the scientific literature and data are available. Results will be assessed to inform disposition of transported adults (*i.e.*, for release above and below dams in the drainage).

Limitations: The assessment will be limited to data collected through 2019.

Environmental & Cultural Compliance: No environmental or cultural review is needed to complete the assessment.

Implementing changes to trapping and transport of adult spring Chinook salmon that return to Minto Trap may require additional NEPA analysis. In that case, this action would require NEPA analysis as part of the interim measures EA. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. The ESA effects fall within scope of the 2008 NMFS BiOp. This measure would require coordination under the Fish and Wildlife Coordination Act (FWCA). Implementation of changes would likely have no potential to effect under Section 106.

Implementation Schedule: Analysis will begin in 2020, with results available in 2021. Results will be reviewed by WATER technical teams, and the Corps will incorporate any refinements to trap and transport operations into the next WFOP, subject to environmental reviews under NEPA and any other applicable laws.

Annual RM&E: N/A

Measure Number: 5

Description: Beginning in fall 2020, the Corps will modify Detroit Dam operations during the drawdown when fish passage rates are high, as follows: Once the reservoir elevation is less than 100 feet over the turbine intakes (elevation 1500 feet to 1450 feet), typically around November 1 through February 1, turbines will not be operated at Detroit Dam between 6:00 AM - 10:00 AM and 6:00 PM - 10:00 PM except for station service power. The Corps will manage discharge from Detroit Dam to reduce TDG levels downstream of Big Cliff dam.

Additional Information: N/A

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams (however, see limitations).

Limitations: If total dam discharge must be increased to achieve flood risk reduction mission objectives during the operational period of this measure, then regulating outlet (RO) and turbine operational objectives of this measure may not be achieved. Minimum gate openings will not be violated during the operation. Operations of the RO and limiting turbine operations may result in unacceptable water temperature effects downstream, and, therefore, achieving objectives of this measure may not be feasible at all times in all years.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: This measure would be implemented beginning in fall 2020 pending completion of environmental and cultural compliance requirements.

Annual RM&E: A rotary screwtrap will be installed and operated below Big Cliff Dam to provide information on the migration timing and size of naturally-produced juvenile salmonids exiting downstream of Detroit and Big Cliff dams. Results will be compared to rotary screwtrap results previously collected under normal operating conditions.

Measure Number: 6

Description: Beginning in 2020, the Corps will operate multiple spillway gates at Big Cliff Dam to spread total flow across the spillway and reduce TDG levels below Big Cliff Dam. The operation occurs when the Corps is operating the spillway (e.g., high flow events). The Corps will monitor TDG downstream and identify the extent that TDG criteria is met under this operation.

Additional Information: *N/A*

Feasibility: This operation is within the range of potential routine operations and is therefore feasible to start immediately.

Limitations: Minimum gate openings will not be violated during the operation. Minimum gate openings may restrict this action depending on the desired outflow. It may also be more difficult to meet downstream ramping rates with large spillway gate openings, so there would need to be flexibility.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: Implementation can begin in 2020. Implementation schedule will be dictated based on operational release needs and turbine capacity. When outflows required exceed turbine capacity, this operation can be implemented hourly.

Annual RM&E: Will rely on the existing USGS gage for monitoring TDG downstream.

Measure Number: 7

Description: Beginning June 1, 2021, when the Detroit Dam reservoir is above the spillway crest, the Corps will use a blend of spillway and turbine releases for summer water temperature management until the reservoir is drawn down below spillway crest. Once the reservoir is below the spillway crest, the Corps will shift to turbine only releases until mid- to late October or until outflow water temperatures reach 50 degrees Fahrenheit. The Corps will utilize the upper RO in conjunction with turbine releases into November.

Additional Information: *N/A*

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams.

Limitations: Dates and duration of spill during summer and fall is dependent on preceding precipitation and stream flow conditions occurring November through May and summer inflows during the operational period. Adjustments may be necessary in spill gate, turbine, and RO releases in order to manage downstream water temperatures.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: Annually, beginning in June 2021 and continued each season as hydrologic conditions can support.

Annual RM&E: The Corps will monitor water temperatures during this operation and summarize them annually in the Willamette Basin Annual Water Quality Report using data from the USGS Niagara gaging station (BCLO/ID 14181500). As noted in Measure 6 above, a rotary screwtrap will be installed and operated below Big Cliff Dam to provide information on juvenile salmonids exiting downstream of Detroit and Big Cliff Dams. Results will be compared to rotary screwtrap results previously collected under normal operating conditions.

Interim measures relating to the South Santiam River

Measure Number: 8

Description: In 2020, the Corps, in conjunction with the WATER technical teams, will develop an initial RM&E plan using existing information to assess the potential for upstream and downstream fish passage in the Middle Santiam River. The RM&E plan would be used to inform future decisions regarding RM&E and fish passage, including the possibility of rebuilding the juvenile fish bypass system at Green Peter Dam.

Additional Information: *N/A*

Feasibility: Development of a RM&E plan is feasible. Data gathering may be included as part of the RM&E plan, with a possible outcome that more research will need to be done to complete the plan.

Limitations: The initial plan will be based on available information. Green Peter Dam is a flood control dam with reservoir levels that fluctuate seasonally with the prescribed water control diagram. Reservoir storage is utilized to achieve downstream flow targets in the South Santiam, and it also stratifies during the summer months. These factors will need to be taken into consideration during development of the RM&E plan.

Environmental & Cultural Compliance: No environmental or cultural review is needed to complete the assessment.

Implementation Schedule: An initial RM&E plan will be prepared, reviewed, and refined by the WATER RM&E Team in 2020. Discussions will occur at the monthly RM&E Team meetings. A finalized RM&E plan based on existing information will be completed by December 2020.

Annual RM&E: RM&E that may occur as a product of the RM&E plan is currently unknown. Any such research would be vetted by the WATER RM&E Team.

Measure Number: 9

Description: Beginning in fall 2020, the Corps will conduct an operation at Foster Dam during fall and spring months. The Corps will operate the spillway from 7:00 PM to 7:00 AM from October 1 - December 15 and March 1 - June 15. From 7:00 PM to 7:00 AM during that timeframe, the turbines will be operated at limited capacity for station service power only. The Corps will coordinate this operation with Measure 10 to ensure that the needs of adult and juvenile salmonids are balanced.

Additional Information: The turbines will be operated at full generation capacity during the day (7:00 AM to 7:00 PM), and the spillway may be operated to pass excess water.

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams.

Limitations: Limited turbine operation is necessary for station service power. If total dam discharge must be increased to achieve flood risk reduction mission objectives during the operational period of this measure, then spillway and turbine operational objectives of this measure may not be achieved.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: This interim nighttime spill operation will begin in fall 2020.

Annual RM&E: No RM&E is necessary for this spill operation because data is available to demonstrate this operation is a safe downstream passage route for outmigrating fish. Research conducted to evaluate routes of passage at Foster Dam indicate juvenile salmon and steelhead pass the dam during nighttime hours and the spillway is the preferred route when the fish weir is not operated.

Measure Number: 10

Description: Beginning approximately July 2020 for one to two months, the Corps will operate Foster Dam using both turbines and spill over fish weirs to optimize temperature for adult salmonid collection and to reduce TDG downstream. The Corps will coordinate with NMFS and WATER groups to evaluate the operation's consequences on water availability and downstream flow objectives (as appropriate, the Corps may modify this operation based on the recommendations from WATER groups and NMFS). The Corps will coordinate this operation with Measure 9 to ensure that the needs of adult and juvenile salmonids are balanced.

Additional Information: The Corps will explore and, if feasible and necessary (in addition to the fish weir spill operations) to optimize temperature conditions in the fish ladder for adult salmonid collection, use portable pumps near the water intake for the fish ladder to optimize temperature conditions in the fish ladder. This interim measure will be performed annually until a long-term solution is implemented or an alternative action resulting from the reinitiated consultation is implemented, whichever is earlier.

Feasibility: Operation of the juvenile fish weir was done in 2019. Extending its use during the conservation season is feasible. Feasibility around the use of portable pumps for the fish ladder is unknown and requires more investigation.

Limitations: Use of the fish weir requires 300 cfs minimum flow. While the weir was operated ad hoc in September 2019, the use was short in duration and the late operation resulted in the majority of fish not being collected until September, over two months after the normal collection peak. Intentional use earlier in the year and over a longer time period requires trade-offs with water availability in the late summer and fall. These trade-offs and potential need to alter minimum flow targets need to be coordinated with the appropriate WATER groups.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: Tentatively, fish weir operation will begin in July 2020 for one to two months. This may change as data and coordination discussions develop.

Annual RM&E: Effectiveness of the weir and pumps will be determined by collection rates at the Foster Adult Fish Facility.

Measure Number: 11

Description: In 2020, the Corps will provide a comprehensive review of options for new outplanting sites or improving existing outplanting sites in the South Santiam River above Foster Reservoir.

Additional Information: Development and use of additional or new release sites (*e.g.*, reservoir) may benefit ESA-listed spring Chinook salmon and winter steelhead. An effort was initiated and completed in 2014 in response to the 2008 NMFS BiOp that assessed alternatives to improve and/or construct additional adult release sites above Willamette Basin dams including in the South Santiam River. In general, an upper and lower site above dams was desired for safe release of adult salmonids.

In the South Santiam River, the current lower release site (River Bend) has issues with increased erosion and is unavailable later during the year due to inadequate conditions (*e.g.*, water levels). Increased erosion could make the site unusable. Stakeholders have expressed a desire to improve the existing lower release site to prevent erosion or finding an alternative site. During the initial site selection process, areas of focus included federal land (*e.g.*, U.S. Forest Service). Potential areas for future release sites may include private land (if authority permits), adult releases into Foster Reservoir, or other federal lands.

Based on the review and in coordination with NMFS, the Corps will propose implementation of operational and structural improvements for outplanting. Operational adjustments could be implemented in late 2020. Structural improvements could be implemented as early as 2021, subject to funding and environmental reviews under NEPA and any other applicable laws.

Feasibility: A review of improvement options to existing or new outplanting sites is highly feasible. Feasibility of implementation is dependent upon details of the improvement or actions. For example, reservoir releases (if the chosen path) may only consist of operational changes that may be more feasible than development of a new outplanting site. Development of a new outplanting site would be more involved and will require other ancillary actions (*e.g.*, NEPA, design, permits).

Limitations: Site availability (*e.g.*, land ownership), funding, and authority.

Environmental & Cultural Compliance: Implementation of outplanting site structural improvements would require NEPA analysis, which will be included as part of the interim measures EA. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. The ESA effects fall within the scope of the 2008 NMFS BiOp. Consultation under Section 106 could be necessary depending on the location/details of any improvements that are to be implemented.

Implementation Schedule: A initial examination of options will be completed in 2020. Any design work required could be done in 2020 or 2021. Potentially, construction could be completed in 2021. Changes to release sites that would only require operational changes (*i.e.*, reservoir releases) could be implemented in 2020. A post-construction evaluation plan could be done if determined necessary.

Annual RM&E: Spawning surveys and genetic pedigree analysis will occur in accordance with the Hatchery Genetic Monitoring Plans (HGMPs) and 2019 NMFS BiOp for the hatchery programs, which will help inform the performance of the trap and haul program.

Measure Number: 12

Description: The Corps will coordinate with Bonneville to provide additional opportunities for flow augmentation releases in the fall months at Green Peter Dam when the conservation pool is depleted, by structuring power generation from the power pool in ways that increase water releases from the project.

Additional Information: Green Peter has 249,900 acre-feet of available storage between maximum conservation pool (1010 feet) and minimum conservation pool (922 feet). Green Peter must fill near maximum conservation pool to meet the downstream flow targets all year. Often, by September or October, stored water is depleted. Per the 2008 NMFS BiOp, when a reservoir is at or below minimum conservation pool elevation, the minimum outflow will equal inflow or the Congressionally-authorized minimum flows, whichever is higher. These flows are much lower than the biological flow targets. There is an additional 62,600 acre-feet of storage within the power pool (between minimum conservation pool (922 feet) and minimum power pool (887 feet). Use of this additional storage while maintaining generation would allow for continued tributary augmentation.

Feasibility: This operation has occurred in the past and is feasible.

Limitations: The power pool is reserved exclusively for power production during the critical power production period. Storage within the power pool will need to be managed so that the power pool maintains enough stored water to maintain power production.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: Implementation would occur annually during September and/or October if additional augmentation water is needed to meet the tributary flow target.

Annual RM&E: Flow will continued to be monitored in the South Santiam River at Foster Dam and downstream at several gauging locations.

Measure Number: 13

Description: By July 2021, the Corps will use existing information to conduct a comprehensive assessment of the potential benefits of reducing spring Chinook salmon hatchery releases in the South Santiam River associated with the agency's Willamette Spring Chinook Hatchery Mitigation Program. The assessment will also consider whether additional RM&E is required to further assess effects of hatchery-origin production on the reintroduction and recovery of ESA-listed salmon above and below dams.

Additional Information: *N/A*

Feasibility: A review and assessment is feasible, and current datasets exist that could inform an assessment.

Limitations: Additional RM&E may be required to fully assess effects of hatchery-origin production on the reintroduction and recovery of ESA-listed salmon above and below dams.

Environmental & Cultural Compliance: No environmental or cultural review is needed to complete the assessment.

Implementation Schedule: An initial assessment will be completed by July 2021.

Annual RM&E: As identified through the assessment.

Measure Number: 14

Description: The Corps and NMFS, in conjunction with the rest of the WATER technical teams, will assess the genetic pedigree of adult spring Chinook returns to Cougar Trap using data collected through 2019. The assessment will evaluate the performance of adult spring Chinook salmon trapped and transported above Cougar Dam and identify refinements to trap and haul approaches for wild (unmarked) adult Chinook returns to Cougar Trap.

Additional Information: *N/A*

Feasibility: The assessment is feasible. Methods for genetic pedigree of salmon populations are well established in the scientific literature and data are available. Results will be assessed to inform disposition of transported adults (*i.e.*, for release above and below dams in the drainage).

Limitations: The assessment will be limited to data collected through 2019.

Environmental & Cultural Compliance: No environmental or cultural review is needed to complete the assessment.

Implementing changes to trapping and transport of adult spring Chinook salmon that return to Cougar Trap does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. Implementation of changes would likely have no potential to effect under Section 106.

Implementation schedule: Analysis will begin in 2020, with results available in 2021. Results will be reviewed by WATER technical teams, and the Corps will incorporate any refinements to trap and haul operations into the next WFOP, subject to environmental reviews under NEPA and any other applicable laws.

Annual RM&E: *N/A*

Measure Number: 15

Description: In 2020, the Corps will employ a split gate operation at the temperature tower at Cougar Dam to minimize fish passage rates through the regulating outlet or penstocks when the pool is greater than 1570 feet and optimize fish passage efficiency when the pool is between 1570 feet and 1516 feet.

Additional Information: Typically, the passage efficiency of the temperature control tower is very low and is arguably the greatest impediment to successful downstream passage (*e.g.*, Beeman and other 2014). However, during the fall drafting of the pool to the minimum conservation elevation, the combination of increased discharge and reduced elevation to the outlets can increase passage rates. Some of this passage will occur when conditions can cause high mortality. Beeman and others (2014) noted that downstream passage survival was best under low pool elevations with low discharge. The goal of this operation is to minimize passage rates during the drawdown period until the desired conditions of a lower pool and reduced discharge can be achieved.

Feasibility: The measure is feasible to implement within the operational constraints of the tower weirs.

Limitations: Weir operation modifications will be limited by the need to provide withdrawal from the reservoir that still results in appropriate downstream water temperatures.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under 106.

Implementation Schedule: Implementation of this measure will begin in 2020.

Annual RM&E: A rotary screwtrap will be installed and operated below Cougar Dam to provide information on the migration timing and size of naturally-produced juvenile salmonids exiting downstream of the dam. Results will be evaluated and compared to rotary screwtrap results previously collected under normal operating conditions.

Measure Number: 16

Description: In 2021, the Corps will limit refill of Cougar Reservoir to 1600 feet beginning February 1 and operate to achieve a reservoir elevation of 1570 feet on or before September 1. Once the reservoir is below 1570 feet to January 1, regulating outlet and turbine operations would follow Special Operations Request (SOR) 2019 and 2020 Table 1, recognizing Table 1 is a concept only and actual operations will be developed by the Corps and managed on a real-time basis. The operation is subject to a determination on whether to implement Measure 16 or Measure 17 (as the operations are not compatible).

Additional Information:

Table 1. Hypothetical operations of Cougar Dam regulating outlet and powerhouse for juvenile fish passage.

Mean 24hr Discharge	NIGHT		DAY	
	RO Flow	Powerhouse Flow	RO Flow	Powerhouse Flow
500	500	0	0	500
1000	1000	0	0	1000
1500	1500	0	500	1000
2000	1500	500	1000	1000
2500	1500	1000	1500	1000
3000	2000	1000	2000	1000

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams (however, see limitations).

Limitations: In dry years, the reservoir does not fill above 1570 feet, so this measure is dependent on sufficient inflow to achieve the elevations stated.

Under this operation, BiOp flow objectives likely would not be met throughout summer and fall months, and the number of days each year that objectives will be met depends on precipitation patterns occurring during the prior winter.

Cougar temperature model simulations with static lake levels of 1550 and 1600 feet year-round during calendar year 2001 (a relatively low flow-year) were used to assess the potential thermal impacts of measure #16. Based on RES-SIM modeling results, lake levels would be between 1532 and 1600 feet during most of the summer. Results from temperature simulations indicate the following: (1) Compared with existing conditions, downstream temperatures during this operation would likely be 1-5 degrees Fahrenheit warmer in July-August (potentially exceeding 60 degrees Fahrenheit), but similar to existing conditions Sep-Dec; (2) Estimated spring Chinook egg emergence timing may be similar to existing conditions.

The actual discharge rates of RO and turbine operations during the reservoir draft period in fall are subject to the reservoir level, minimum gate openings, and turbine operating range. If total dam discharge must be increased to achieve flood risk reduction mission objectives during the operational period of this measure, then RO and turbine operational objectives of this measure may not be achieved. Minimum gate openings will not be violated during the operation.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This action would require NEPA analysis as part of the interim measures EA. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would result in a change in pool level, potentially impacting archeological sites within the reservoir. This would require consultation under Section 106 as well as survey for areas affected and monitoring of site impacts.

Implementation Schedule: This operation will begin in February 2021, pending completion of NEPA and NHPA compliance, unless it is determined that Measure 17 will be implemented instead.

Annual RM&E: A rotary screwtrap will be installed and operated below Cougar Dam to provide information on the migration timing and size of naturally-produced juvenile salmonids exiting downstream of the dam. Results will be evaluated and compared to rotary screwtrap results previously collected under normal operating conditions.

Measure Number: 17

Description: The Corps will model the following operation to determine, in coordination with NMFS, whether the operation should replace Measure 16 for implementation (as the operations are not compatible). The proposed operation would delay refill of Cougar Reservoir to maintain a lower pool from February 1 to May 1 (depending on hydrology), where the lower pool levels would be determined in coordination with NMFS and informed by hydrologic modeling that balances fish passage performance, supplementing downstream flows, and water temperature operations. April 1 to June 15 regulating outlet and turbine operations would follow SOR 2019 and 2020 Table 1, recognizing Table 1 is a concept only and actual operations will be developed by the Corps and managed on a real-time basis.

Additional Information:

Table 1. Hypothetical operations of Cougar Dam regulating outlet and powerhouse for juvenile fish passage.

Mean 24hr Discharge	NIGHT		DAY	
	RO Flow	Powerhouse Flow	RO Flow	Powerhouse Flow
500	500	0	0	500
1000	1000	0	0	1000
1500	1500	0	500	1000
2000	1500	500	1000	1000
2500	1500	1000	1500	1000
3000	2000	1000	2000	1000

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams. However, to avoid negative effects resulting from not refilling Cougar Reservoir adequately by summer on the ability to meet instream flow targets, collect adult spring Chinook salmon at the Cougar Dam Adult Fish Facility, and on incubating eggs below Cougar Dam, hydrologic modeling will need to be completed to evaluate what pool elevations and delayed refill schedule can provide improve downstream passage in spring and still allow for the reservoir refill adequately to meet critical fish and wildlife needs.

Limitations: To maintain a lower reservoir elevation at specific target elevation from February to May 1, Cougar Dam water discharge levels will mirror inflow into Cougar Reservoir, except when it must be reduced or increased for flood management during February through spring. A delayed refill from 1532 feet until mid-June will prevent refill of Cougar Reservoir under all water year types. After June 15, refill of the reservoir will occur to the extent inflow can support while meeting downstream flow targets. BiOp flow targets would not be met throughout summer and fall months under this operation.

Cougar temperature model simulations with static lake levels of 1500 and 1550 feet year-round during calendar year 2001 (a relatively low flow-year) were used to assess the impacts of not refilling from 1532 feet until June 15. Based on RES-SIM modeling results, lake levels would rarely exceed 1532 feet during the summer. Results from these simulations indicate that compared with existing conditions, downstream temperatures during this operation would likely be 1-5 degrees Fahrenheit cooler April-July and up to 6 degrees Fahrenheit warmer October-November. Estimated chinook egg emergence timing would likely be 10-21 days earlier than existing conditions.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: Prior to implementation, this action would require NEPA analysis as part of the interim measures EA. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would result in a change in pool level, potentially impacting archeological sites within the reservoir. This would require consultation under Section 106 as well as survey for areas affected and monitoring of site impacts.

Implementation Schedule: Hydrologic modeling will be completed during summer 2020. After results are available, they will be reviewed to determine if Measure 17 should replace Measure 16 for implementation.

Annual RM&E: If implemented instead of Measure 16, a rotary screwtrap will be installed and operated below Cougar Dam to provide information on the migration timing and size of naturally-produced juvenile salmonids exiting downstream of the dam. Results will be evaluated and compared to rotary screwtrap results previously collected under normal operating conditions.

Measure Number: 18

Description: In 2020, the Corps will operate Dexter Trap, or fund the Oregon Department of Fish and Wildlife (ODFW) to operate Dexter Trap, to prioritize best management practices for spring Chinook salmon being outplanted above Hills Creek and Lookout Point Dams. This includes assisting with the collection of salmon to reduce delay in migration timing, ensuring that fish in good condition are collected for outplanting, and collecting and transporting adults over multiple days during the migration season to avoid delaying adults below or within Dexter Trap.

Additional Information: The Dexter Trap is currently operated by ODFW to collect broodstock for the Willamette Fish Hatchery in Oakridge, OR, fish for food, and for outplanting upstream of Lookout Point and Hills Creek dams. With implementation of this measure, the Corps (or its contractor) will assist with collection of adult spring Chinook salmon for transport upstream in order to reduce delay in migration timing and ensure fish in good conditions are collected for release upstream. At the time of sorting, fish will be mechanically crowded into an elevator that lifts them to an anesthetic tank. After fish are sedated, they will be sorted and loaded into a hauling truck for transportation for release above the dams into the North Fork of the Middle Fork of the Willamette River. Collection and transport of adults will occur over multiple days during the migration season to avoid delaying adults below or within Dexter trap.

Feasibility: This measure is feasible.

Limitations: Coordination with ODFW is required. Previous coordination for research purposes was successful in achieving hatchery brood collection and upstream transport objectives.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: This measure will be implemented in 2020 following coordination with ODFW.

Annual RM&E: Standard trapping and transport data will be collected and summarized, including the number, size, sex, and condition of each adult collected, transported and released on each date, and release location.

Measure Number: 19

Description: By July 2021, the Corps will use existing information to conduct a comprehensive assessment of the potential benefits of reducing spring Chinook salmon hatchery releases in the Middle Fork Willamette River associated with the agency's Willamette Spring Chinook Hatchery Mitigation Program. The assessment will also consider whether additional RM&E actions are required to further assess effects of hatchery-origin production on the reintroduction and recovery of ESA-listed salmon above and below dams.

Additional Information: *N/A*

Feasibility: A review and assessment is feasible, and current datasets exist that could inform an assessment.

Limitations: Additional RM&E may be required to fully assess effects of hatchery-origin production on the reintroduction and recovery of ESA-listed salmon above and below dams.

Environmental & Cultural Compliance: No environmental or cultural review is needed to complete the assessment.

Implementation Schedule: An initial assessment will be completed by July 2021.

Annual RM&E: As identified through the assessment.

Measure Number: 20

Description: Beginning in fall 2020, the Corps will implement regulating outlet spill operations daily from 6:00 PM to 10:00 PM at Hills Creek Dam when the reservoir elevation is less than or equal to 50 feet over the turbine intakes (expected to occur by December 1) through March 1.

Additional Information: N/A

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams (however, see limitations).

Limitations: Total daily discharge levels are expected to be consistent with typical past operations of Hills Creek Dam. The actual discharge rates of RO and turbine operations during the reservoir draft period in fall are subject to the reservoir level, minimum gate openings, and turbine operating range. If total dam discharge must be increased to achieve flood risk reduction mission objectives during the operational period of this measure, then RO and turbine operational objectives of this measure may not be achieved (*i.e.*, the turbines may need to be operated). Minimum gate openings will not be violated during the operation. Discharge objectives and day vs. night objectives for turbines and the RO may not be achieved when RO gate limitations do not support total outflow needs to meet flood risk reduction operations.

The operation is subject to coordination with the U.S. Fish and Wildlife Service regarding potential impacts to bull trout.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation Schedule: This operation is scheduled to be implemented beginning in 2020.

Annual RM&E: A rotary screwtrap will be installed and operated below Hills Creek Dam to provide information on the migration timing and size of naturally-produced juvenile salmonids exiting downstream of the dam.

Measure Number: 21

Description: Beginning in 2020, the Corps will refill Lookout Point Reservoir to 900 feet (if inflows allow) following the normal reservoir refill schedule in the water control diagram and then operate spillway gates to provide surface spill in the spring and summer as long as hydrologic conditions can support the operation, with a total discharge to meet downstream flow targets. During this same period, the Corps will conduct spill operations at Dexter Dam daily from 6:00 PM to 10:00 PM and limit turbine operations unless total discharge results in high TDG and there is a need to reduce spillway flows.

Additional Information: N/A

Feasibility: This operation can be accomplished consistent with operating protocols as described in water control manuals and water control diagrams (however, see limitations).

Limitations: Surface spill from Lookout Point Dam during the summer can increase water temperatures and create high TDG levels, both of which can impact hatchery operations at Dexter Ponds and Trap facilities. Operations may need to be adjusted to limit those impacts.

Minimum gate openings will not be violated during the operation. Minimum gate openings may restrict this action depending on the desired outflow. It may also be more difficult to meet downstream ramping rates with large spillway gate openings, so there would need to be flexibility.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This measure does not require additional NEPA analysis. The ESA effects fall within the scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106.

Implementation schedule: Implementation will begin in 2020 if hydrologic conditions support.

Annual RM&E: A rotary screwtrap will be installed and operated below Lookout Point or Dexter Dam to provide information on the migration timing and size of naturally-produced juvenile salmonids exiting downstream of the dam(s). Results will be evaluated and compared to rotary screwtrap results previously collected under normal operating conditions.

Measure Number: 22

Description: Beginning in winter 2021, the Corps will operate trap(s) upstream of Fall Creek Reservoir to collect and transport juvenile spring Chinook salmon around the Reservoir and Fall Creek Dam during their migration season (approximately January to May), and the Corps will also consider installing fish guidance measures, such as resistance board weirs, to improve collection rates.

Additional Information: *N/A*

Feasibility: Traps, especially rotary screwtraps, are used regularly to collect emigrating juvenile salmon from streams. Resistance board weirs also have been used in combination with juvenile traps to increase trapping efficiency. Both screwtraps and resistance board weirs are designed to be operated in variable stream flow conditions.

Limitations: Traps most likely will not be operated during high flow events. Trapping efficiency is expected to be 5 to 10% without guidance structures installed.

The operation is subject to coordination with the U.S. Fish and Wildlife Service on the potential impacts to Oregon chub and western pond turtles.

Environmental & Cultural Compliance: If the action requires in-water work, ground disturbance, or other site improvements, it would require NEPA analysis as part of the interim measures EA. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. The ESA effects fall within scope of the 2008 NMFS BiOp. This measure would likely have no potential to effect under Section 106 if using existing sites; otherwise, consultation under Section 106 may be required.

Implementation Schedule: Trapping operations would begin in winter 2021.

Annual RM&E: The number of juvenile Chinook salmon collected, transported, and released by date will be recorded. Numbers of juvenile spring Chinook in standardized length classes will be recorded.

Measure Number: 23

Description: As early as 2021, the Corps will provide surface spill from Fall Creek Reservoir from May 1 (or as soon thereafter as the reservoir elevation is above the spillway crest) through July 1, as hydrology allows.

Additional Information: N/A

Feasibility: Use of the spillway at Fall Creek Dam occurred in April 2019 for the first time since operation of the dam. Fish were documented to pass downstream over the spillway.

Limitations: The Corps will monitor and assess downstream channel erosion and gravel movement/buildup as well as fish stranding and displacement of resident fish, turtles, and other wildlife. Oregon Chub and western pond turtle reside downstream of the spillway and may be affected by this operation. The operation is subject to coordination with the U.S. Fish and Wildlife Service on the potential impacts to Oregon chub and western pond turtles.

The ability (magnitude and duration) to provide surface spill is dependent on annual hydrologic conditions and the need to manage discharges to achieve downstream flow targets. Surface spill will not be possible in years when the reservoir does not fill above spillway crest.

Dam operations that are not prescribed within the water control plan or the water control manual will require a deviation. A risk and uncertainty analysis shall be performed to determine potential consequences of the deviation. Deviations are developed within the Portland District, and approval responsibility is within the Northwestern Division.

Environmental & Cultural Compliance: This action would require NEPA analysis as part of the interim measures EA. The interim measures EA would take approximately 120 days to complete once funding is received and the necessary operational modeling and engineering evaluations are completed. The ESA effects fall within scope of the 2008 NMFS BiOp. As this operation is in line with normal operations and would only take place if the reservoir filled above the spillway crest, there is little likelihood that cultural resources within the reservoir would be impacted. More frequent use of the spillway itself would not be an impact. If based on modeling it was thought that this measure could cause erosion downstream, then consultation under Section 106 may be required.

Implementation Schedule: Annually beginning as early as May 1, 2021.

Annual RM&E: A rotary screwtrap will also be operated below Fall Creek Dam during operation of the spillway to gather information on the number, size, and species of fish passing downstream.